

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## SUPPLEMENTARY EXAMINATION

TRIMESTER 1, 2015/2016

**PMC0075 – CALCULUS**  
( All sections / Groups )

17 NOV 2015  
9.00 AM – 11.00 AM  
(2 HOURS)

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### INSTRUCTIONS TO STUDENT

1. This question paper consists of 3 pages with **FIVE** questions.
  2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
  3. Please write all your answers in the answer booklet provided.
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**ANSWER ALL QUESTIONS****Question 1 [10 marks]**

a) Evaluate the limits:

i)  $\lim_{x \rightarrow 0} 5\pi^2$

ii)  $\lim_{x \rightarrow -\infty} \frac{5x^3 + 2x^2}{x^2 + x + 7}$

iii)  $\lim_{x \rightarrow 1} \left[ \frac{(x+1)(x-1)}{x^2 - 5x + 4} \right]$

iv)  $\lim_{x \rightarrow 0} \frac{\tan x}{x}$

[7 marks]

b) Given  $f(x) = \begin{cases} -x^4 + 3, & \text{if } x \leq 2 \\ x^2 + 9, & \text{if } x > 2 \end{cases}$

Find:

i)  $f(2)$

ii)  $\lim_{x \rightarrow 2^-} f(x)$ ,  $\lim_{x \rightarrow 2^+} f(x)$  and  $\lim_{x \rightarrow 2} f(x)$

Is  $f(x)$  continuous at  $x = 2$ ? Justify your answer.

[3 marks]

**Continued...**

**Question 2 [10 Marks]**

a) Find  $\frac{dy}{dx}$  for the following functions:

i)  $y = \frac{4-3x}{2x+1}$  [2 marks]

ii)  $y = 3x^2 e^x$  [2 marks]

iii)  $x^2 = \sin(x^2 + y^2)$  by Implicit Differentiation [3 marks]

b) Find  $\frac{dy}{dx}$ . Rearrange the function first by applying law of logarithm.

$$y = \ln \left[ \frac{x^2 + 2x}{\sqrt{2x-1}} \right]$$
 [3 marks]

**Question 3 [10 Marks]**

a) Compute the integral

$$\int_1^2 (3-x)^2 dx$$
 [3 marks]

b) Use Integration by Parts to find

$$\int \ln x \, dx$$
 [3 marks]

c) Suppose

$$\frac{6x-9}{(x^2-1)} \equiv \frac{A}{x-1} + \frac{B}{x+1}$$

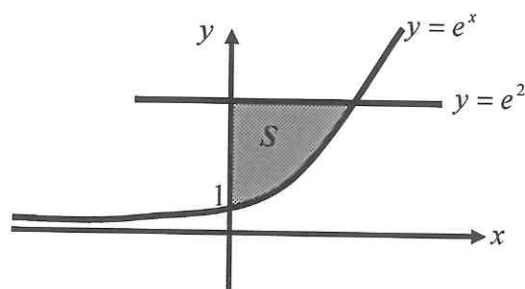
i) Find the values  $A$  and  $B$

ii) Hence, find  $\int \frac{6x-9}{x^2-1} dx$  [4 marks]

**Continued...**

**Question 4 [10 Marks]**

- a) Consider a rectangle where the sides are changing but the area is always  $100 \text{ cm}^2$ . One side changes at the rate of  $3 \text{ cm}$  per second when it is at  $20 \text{ cm}$  long. Find the rate of change of the other side. [4 marks]
- b) The region  $S$  shown in below figure is bounded by the line  $y = e^2$ , the curve  $y = e^x$ , and the  $y$ -axis. By using the washer method, find the volume of the solid generated by rotating the region  $S$  about the  $x$ -axis. Leave your answer in terms of  $\pi$ . [6 marks]

**Question 5 [10 Marks]**

- a) Solve the following differential equation by Separable of Variables Method.  
 $y' \cdot (\cos 2x) = \tan 2x$  [3 marks]
- b) Given a differential equation  $y'' + 4y' + 8y = 16 \cos 4x$
- Write an Auxiliary Equation and find the Complementary Solution.
  - For Particular Solution, choose initial guess  $y_p(x) = A \cos 4x + B \sin 4x$  where  $A$  and  $B$  are constants to find.
  - Write the general solution of the differential equation. [7 marks]

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